# HAWK5000 Operators Manual

Keison Products
P.O. Box 2124, Chelmsford
CM1 3UP, England

Tel: +44 (0) 1245 600560
Fax: +44 (0) 1245 600030
Email: sales@keison.co.uk

**www.keison.co.uk**

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# GENERAL INFORMATION

This is the section, which gives you an introduction to the HAWK5000 system and its hardware. It will make the subsequent operation easier to understand if you read through this first.

Software operations are separately described in the Hawk Commander and Hawk Reporter Professional text files.

The safety section should be read before starting the set up operation. Throughout the text, sections where specific safety procedures should be followed or special care taken are marked with a warning triangle, e.g.

Before going any further, check against the parts list below that all the components you need have been included in the package.

## THE HAWK PACKAGE

**Standard Package:**

1x HAWK 5000
3 x 1000 Amp Current Transformers (CTs)
3 x colour coded CT cables
1 x PHASER
1 x mains lead
1 x RS 232 cable
1 x System Software Envelope
1 x Carry Case

**Optional Accessories**

Hawk Reporter Professional Software
200 Amp CTs (set of 3) 1000:1 ratio
200 Amp CTs (set of 3) high resolution 200:1 ratio
3000 Amp CTs (set of 3) with switchable ranges 3000:1, 2000:1 and 1000:1.

**Choice of Inputs...**

HAWK5000 accepts inputs from up to three CT clamps for measuring AC current directly, as well as inputs from up to two pulse output devices, e.g.. optical meter readers.

There is a wide range of clamps and current transformers available to suit different current ranges and cable or busbar configurations. The chosen clamp or transformer must not exceed 1 Amp ac output when monitoring maximum current.

## SCALE SETTING

### Pulses

Pulse inputs need to be defined as follows: the **unit name**, **scale** and **offset values** for the two pulse inputs. If pulse inputs are not being used, then this section need not be set-up. The scale and offset are implemented as follows:

Value = ( Number-of-pulses x scale ) + offset

The offset value is required for those meters that give a set number of pulses to represent a zero output just as in a 4 to 20 mA current loop.

### Input scaling

Each of the two scale factors is used to convert the input measured by the HAWK back to an actual voltage or current.

For example, if 1000 to 1 CT clamps are being used directly around the conductors being measured, the current reaching the HAWK CT input will be one thousandth of the current flowing in the main conductor, and so the value measured by the HAWK must be multiplied by one thousand to convert back to the actual current value in amps. If the ***'Amps Scale Factor'*** is set to 1000, this multiplication will be done automatically within the HAWK, so the uploaded survey data will be correct.

Thus the ***Amps scale factor*** will usually be the CT clamp ratio (normally 1000). However if the CT clamps are connected to the secondary of metering or protection CTs, rather than around the conductors themselves, the Amps scale factor should be the ratio of the metering CT multiplied by the ratio of the CT clamp.

The ***"Volts scale factor"*** should be set to the ratio of the voltage of the supply to the voltage powering the HAWK. If the RMS phase to neutral voltage of the supply if 240 Volts, and the HAWK is being powered by 240 Volts, then the scale factor should be 1. If the supply being measured is 11 kV, and the HAWK is being supplied from this via a step-down transformer at 240 V, then the scale factor should be 11000 divided by 240 (45.83333).

### Measuring

The HAWK measures mains voltage and frequency from its mains supply.

The other two phases of a three-phase system are assumed to have the same amplitude, waveform and frequency, but to be 120 degrees apart.

The HAWK5000 does not require any connections to live bare conductors.

**Range of measurements...**

HAWK5000 is capable of measuring any or all of the following:

| | |
|---|---|
| Current | x 3 phases |
| Power | x 3 phases |
| VA | x 3 phases |
| Total Reactive power | x 3 phases |
| Lagging reactive power | x 3 phases |
| Pulses | x 2 |
| Voltage | x 1 |
| Frequency | x 1 |

## REQUIREMENTS

Since the HAWK makes its voltage measurement from the mains input power source, **it must be powered from one of the three phases it is to measure**, or, in the case of high voltage systems, the output of a voltage step-down transformer which is fed from one of the three phases being measured.

# SAFETY

**This equipment must only be used by trained and competent personnel after due consideration of all potential hazards.**

**This equipment must be earthed.**

**CTs should not be used on bare uninsulated live conductors unless they carry the appropriate rating and are labelled accordingly.**

**The Hawk5000 itself is designated:**

**Class 1**

**Installation Category: II**

**Pollution Degree: 2**

**Working Voltage: 260V max.**

## ELECTROMAGNETIC COMPATIBILITY

The European Council Directive 89/336/EEC requires that electronic equipment does not generate electromagnetic disturbances that exceed defined levels and has an adequate level of immunity to enable it to operate as intended. The specific standards applicable to this product are detailed in the appendices.

Since there are many electrical products in use that pre-date this Directive and may emit electromagnetic radiation in excess of the standards defined in the Directive, there may be occasions where it would be appropriate to check for acceptable operation prior to use. The following procedure may be adopted:

Go through the normal start up sequence in the location where the equipment is to be used.

Switch on all localised electrical equipment that may be capable of causing interference.

Check that all readings are as expected. (A level of disturbance in the readings is acceptable.) If not adjust the position of the equipment to minimise the interference or switch off, if possible, the offending equipment for the duration of the test.

At the time of updating this manual Kane International Ltd is not aware of any field based situation where such interference has ever occurred and this advice is only given to satisfy the requirements of the Directive.

# GETTING STARTED WITH THE HAWK5000

## OVERVIEW

The operations required to perform a survey are:

a) Connect the HAWK to a PC and run the Commander or Hawk Reporter Professional program.

b) Enter the SET-UP section of the program.

c) Set up the HAWK as required (period length etc.).

d) Start a new survey.

e) Take the HAWK to the site to be surveyed.

f) Connect the HAWK to the cables to be measured

g) Verify that the HAWK is recording correctly.

h) Leave for the required length of the survey.

i) Disconnect the HAWK, and bring it back to the office.

j) Connect the HAWK to a PC and download the data.

The resulting data file may be examined using the 'ANALYSE' facility built-in to the control software, or it may be exported using the 'EXPORT' facility to produce a data file suitable for use by a spreadsheet.

## SETTING-UP THE HAWK

1. Connect the mains lead to the HAWK, and switch on.
2. Connect the serial lead between the serial connector on the HAWK, and the serial connector on the PC.
3. Run the Commander or Reporter program on the PC.
4. The status window at the bottom of the screen should display ***'Link Established'*** after a few seconds.

Follow the detailed instructions of the Hawk Commander or Hawk Reporter Professional text files.

**ON-SITE**

## Starting a Survey

Assuming that the HAWK has previously been set up, and you are now at the site to be surveyed: If you can arrange to have a portable computer with you, the HAWK5000 software and a suitable serial lead, this will allow you to verify correct operation, and also to change the set-up, or start a new survey if necessary.

First connect the CT clamps to the HAWK and then position the clamps around the conductors to be measured. You must ensure that the clamps are fully closed otherwise errors will occur.

Next, connect any pulse input devices (if in use).

Now power the HAWK from a suitable mains supply.

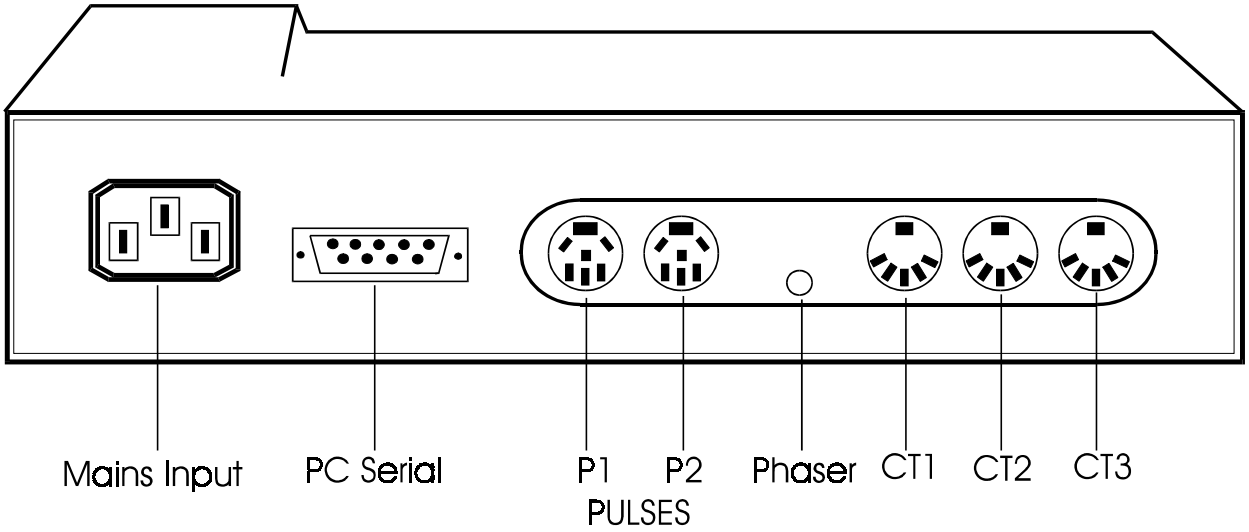
If the phaser light flashes, use the phaser, otherwise the logging light should flash every few seconds.

If any of the three green CT lights flash, this indicates a connection error:

probably either one or more CT clamps on backwards,

or two CT clamps on the wrong phases.

If the survey is being started when the load on the system is very low, the power factor may be very low, and this may, in extreme cases, cause the HAWK to allocate phases wrongly. If this is a possible situation, use the PHASER as below to over-ride any internal phase allocation.



## CONFIRMING CORRECT OPERATION

1. The ***'LOGGING'*** light should now flash every few seconds to indicate that the HAWK is recording data in memory.

2. Each of the three red lights adjacent to the CT connectors indicates that is the phase, which is also connected to the HAWK mains power.

3. Each of the three green lights adjacent to the CT connectors indicates that current has been detected on the corresponding phase. If any of these three green lights are flashing, this means that the corresponding CT is on the wrong phase, or is reversed: try swapping the two offending CT, or connecting the one offending CT the other way around on the cable.

4. When none of the three green CT lights are flashing, all connections are correct.

5. The values being measured may be viewed by connecting a portable computer to the HAWK.

## THE PHASER

Under normal circumstances, the PHASER will not be needed, as the HAWK will be able to perform phase allocation on its own. However, in real life, **bad power factors**, CT clamps on the wrong way round, or on wrong phases, and reversed mains supply to the HAWK will all contribute and may make it impossible for the HAWK to allocate phases correctly. This is where the PHASER is needed.

The PHASER is a non-contact voltage detector which transmits the phase of any AC voltage it picks up to the HAWK.

If the HAWK has been set up for phase allocation by phaser, the HAWK will flash the **'phaser'** light on the main box, and will not start a new survey until the PHASER is used.

If the HAWK has been set up for automatic phase allocation, a survey will start with the HAWK attempting to allocate phases itself, but the PHASER may be used, and will over-ride the previous allocation.

**Using the PHASER involves**

a) Plug the PHASER Into the phaser connector on the HAWK.

b) Locate the conductor around which the CCT 1 (red) CT clamp is connected.

c) Hold the nose of the PHASER near to this conductor, and press the button.

The PHASER should NOT come into contact with any live conductors. The light on the PHASER should come on indicating that the PHASER is detecting a voltage.

d) Hold the button down until low pitched beeps change to high pitched beeps. The can take up to 10 seconds.

e) Release the button and move the PHASER away from the conductor.

The PHASER may now be disconnected from the HAWK.

NOTE: The PHASER is an isolated device and is battery powered. It contains a 9 volt (PP3 type) battery. Since it is used very infrequently for short periods the battery should last for many years. If the battery does require replacing access can be obtained by removing the two screws that hold the case together.

## USING PULSE INPUT DEVICES

The two pulse inputs are designed for connection to devices which have an output signal in the form of a stream of pulses, for example:

Electricity meters with volt-free contact outputs
Fluid flow meters

Each pulse connector has two pulse signal connections, a high speed, and a low speed input. If in doubt, use the low speed connection.

Volt-free terminals should be connected between the low speed input and pulse ground.

Devices such as optical meter readers, which require a power supply should take this supply from the +12V DC power out pin.

Note that this power output is unregulated, and so can rise well above 12 Volts.

Up to a total of 100 milliamps may be drawn from the two pulse connector power out pins.

## DOWNLOADING DATA

a) If the HAWK is being taken back to the office, switch off the power to the HAWK and disconnect the CT clamps from the cables.

b) Back at the office, connect the mains cable to the HAWK, and switch on. Connect the serial cable between the HAWK and the PC.

c) Run the HAWK5000 control program on the PC, and download the stored data.

# Troubleshooting

## HAWK5000 program

a) The program displays '***Logger Not Found***' for more than a few seconds:

Is the HAWK powered up?

Is the HAWK connected by the correct serial lead to the PC?

Is the HAWK connected to the correct serial port on the PC?

*Click SCAN NOW to try to re-establish communication*

## Starting a survey : Logging light doesn't flash

a) A new survey has not been started:

Use HAWK5000 control program to start a new survey.

b) Start time not yet reached:

Use HAWK5000 control program to change start time.

c) Start next power up:

Disconnect the mains power lead from the HAWK and then re-connect it.

d) If Phaser light is flashing, use PHASER.

## Starting a survey: HAWK bleeps and CT lights flash

a) The HAWK is set up for three-phase operation, but the CT clamps are not on three different phases:

Use HAWK5000 program to change set-up.

b) The HAWK is set up for single-phase operation, but the CT clamps are not all on the same phase:

Use HAWK5000 program to change set-up.

c) One or more of the CT clamps are on backwards:

Ensure the arrow on the CT clamps points towards the load.

d) In three phase mode, if two of the CT lights flash, try swapping the CT clamps over. If two of the CT lights are flashing, this may be because the phase rotation is marked wrongly on the cables at that particular site. This can be confirmed by the use of a phase rotation meter. If this is the case, swap over the CTs on the yellow and blue phases.

## Recorded data

a) Some or all data is zero:

Are either of the input scale factors zero?

Were any or all of the CT clamps connected incorrectly?

Try using **survey OVERVIEW** to check that all the data really is zero.

# TECHNICAL INFORMATION

## SPECIFICATION

| | | |
|---|---|---|
| **AMPERES** | | **Notes** |
| Range | 0.4 to 1000 A | 2, 5 |
| Resolution | 0. 1A | |
| Accuracy | 1% | 1 |
| **VOLTS** | | |
| Range | 0 to 280 V | 4 |
| Resolution | 0.5 V | |
| Accuracy | 1% | 3 |
| **PULSES** | | |
| Range | LO: 0 to 25 Hz<br>HI: 25 to 20000 Hz | |
| Resolution | 1 pulse | |
| Accuracy | 1 pulse | |
| **FREQUENCY** | | |
| Range | 45 to 64 Hz | |
| Resolution | 0.01 Hz | |
| Accuracy | 0. 1% | |
| **kVA lagging** | | |
| Range | 1000 kW | 2 |
| Resolution | 0. 1% | |
| Accuracy | 2% | 1, 3 |

Notes:
1. Excludes CT accuracy
2. With 1000: 1 CTs
3. Assumes all three voltages are equal and equispaced
4. Exceeds the range over which the HAWK will function
5. Reduced accuracy below this range

## WORKING CONDITIONS

| | |
|---|---|
| Supply voltage | |
| (240V model) | 180 to 260 V AC |
| (120V model) | 90 to 130 V AC |
| | (not to exceed +10% of the nominal voltage) |
| Supply Frequency | 40 Hz - 65Hz |
| Max. power | 20 VA |
| Max. Relative Humidity | 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C |
| Main Fuse | 100 mA Anti-surge |
| Ambient Temperature | 5 to 40 degrees C |
| Altitude | Indoor use up to 2000m |
| Protection | IP20 |
| Pollution Degree | 2 |
| **Dimensions** | |
| Size | 282 x 222 x 64 mm |
| Weight | 1.8 Kg (without accessories) |
| Logging period | Programmable: 2 secs to 2 hours |
| Measurement period | 2 secs to 11 secs (depends on logging period) |
| Sample rate | 10000 samples per second |

## PHASER

| | |
|---|---|
| Power | 9 volt battery( PP3 type) |
| Size | 200 x 35 x 31 mm |

## MAINTENANCE AND CLEANING INSTRUCTIONS

The jaw faces of the current clamps must always be clean. Clean them regularly and keep them lightly oiled to avoid oxidation.

Do not leave the clamp in damp conditions and never expose it to running water.

Clean the handle and casing with a cloth moistened with a light detergent, use a cloth slightly moistened with clean water to remove residues. Dry with clean soft cloth, never expose the clamp to running water.

After cleaning leave overnight in a warm room to ensure that all moisture evaporates.

## CONNECTIONS

Looking at the back of the HAWK from left to right the connections are:

Mains Power via an IEC connector
PC serial interface via a 9 pin Cannon 'D' type.
2 off pulse input via 6 pin circular DIN connectors
the phaser input
3 off current transformer inputs via 5 pin DIN connectors.

The serial interface connections are:

1
2 TX data
3 RX data
4
5 signal ground
6 RTS handshake out
7
8 CTS handshake in

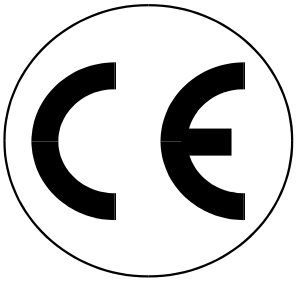
The Pulse input connections are:

1 Low frequency input
2 Ground
3 High frequency input
4 +12V DC power out
5 Not connected

The current transformer input connections are:

1 AC current in
2 aux.
3 AC current return
4 +V aux.
5 -V aux.

## CE marking



This product has been tested for compliance with the following generic standards:

EN 50081-1
EN 50082-1

and is certified to be compliant

Specification EC/EMC/KI/Hawk 5000 details the specific test configuration, performance and conditions of use.

## Low Voltage Directive

**Protection Against Electric Shock** (in accordance with EN 61010-1 : 1993)

This instrument is designated as:

Class I equipment
Installation category II
Pollution degree 2
Indoor use only
Altitude to 2000m
Ambient temperature 0°C-40°C
Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50%RH at 40°C
Mains supply 180-260V AC
Inputs and connections other than the mains voltage supply should not exceed 30V rms and 42.4 V peak or 60 V DC.

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

**UK Office**
**Keison Products,**
**P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.**
**Tel: +44 (0)1245 600560**
**Fax: +44 (0)1245 808399**
**Email: sales@keison.co.uk**

Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.